

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 12 and 14-20 are presently active; Claim 12 having been amended, Claim 13 having been canceled without prejudice, and Claims 17-20 having been added by way of the present amendment.¹

In the outstanding Office Action, Claim 12 was rejected under 35 U.S.C. § 102(b) as anticipated by Ushikoshi et al (U.S. Pat. No. 5,306,895). Claims 13 and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ushikoshi et al in view of Kersten et al (U.S. Pat. No. 5,919,385) or Hecht et al (U.S. Pat. No. 5,877,475). Claim 15 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Ushikoshi et al in view of Arena et al (U.S. Pat. No. 5,635,093) or Nobori et al (U.S. Pat. No. 5,616,024). Claim 16 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Ushikoshi et al in view of Yoshida et al (U.S. Pat. No. 6,080,970).

Firstly, Applicants acknowledge with appreciation the courtesy of Examiner Paik to conduct an interview in this case on August 23, 2004. During the interview, the issues identified in the outstanding Office Action were discussed as substantially summarized herebelow. Changes to Claim 12 were discussed to clarify that ceramic heater is a sintered nitride ceramic plate or a sintered carbide ceramic plate and a heating element formed inside of the ceramic plate, and includes a temperature-measuring element comprising a sheath type thermocouple is set up in the bottomed hole with the temperature-measuring element being pressed on the bottom portion of a bottomed hole.²

¹ Support for the features in new Claims 17, 18, and 19 is found in the specification respectively on pages 8, 20, and 12.

² Support for the amended features in Claim 1 is found in the specification on page 4, at lines 11-14, and in Claim

According to the present invention, in order to more precisely measure the temperature of the heating surface, the temperature-measuring element is included in the bottomed hole, and the bottom portion of the bottomed hole is located relatively nearer to the heating surface than the heating element. The temperature measurement can be carried out without being affected by either the atmosphere or the temperature change of the heating element.

The ceramic heater of the present invention comprises a *sintered* ceramic plate. Thus, the surface of the bottom portion of the bottomed hole in the ceramic plate has irregularities due to the existence of fine grains. A precise temperature measurement is not possible when the temperature-measuring element (i.e. a thermocouple) contacts such an irregular surface of the bottom portion and space is formed between the temperature-measuring element and the irregular surface. This problem is specific to a ceramic heater comprising a sintered ceramic plate.

Attached is a photograph of a surface of aluminum nitride ceramic showing the surface irregularities. Applicants submit that a precise temperature measurement is not possible when a temperature-measuring element merely contacts this type of surface. Rather, as recited in presently amended Claim 12, when the temperature-measuring element is pressed on the bottom portion of the bottomed hole, a precise measurement becomes possible.

According to the invention presently defined in Claim 12, a sheath type thermocouple is employed as the temperature-measuring element since it has high rigidity and is suitable to be pressed. The sheath type thermocouple is pressed mechanically on the bottom portion of the bottomed hole in order not to make space between the sheath type thermocouple and the irregular surface. A precise temperature measurement can be realized. In other words, a sheath type thermocouple having a high rigidity and suitable to be pressed is employed to solve a problem caused when a temperature-measuring element is set up in a bottomed hole formed

in a sintered ceramic substrate.

The cited references do not teach or suggest such an idea.

Ushikoshi et al disclose a ceramic heater having a ceramic substrate and a heating resistive body embedded in the ceramic substrate. Figure 32 shows that a thermocouple 10 is inserted in the insertion hole 56 in the ceramic substrate 4. Ushikoshi et al teach to place the thermocouple 10 in the tubular body 50C (col. 26, lines 29 to 35). Ushikoshi et al do not teach to use a sheath type thermocouple. Further, Ushikoshi et al do not teach to press the thermocouple 10 on the bottom portion of the insertion hole 56.

Therefore, one cannot expect from Ushikoshi et al that a precise temperature measurement is realized by pressing a sheath type thermocouple on the bottom portion of a bottomed hole formed in a sintered ceramic plate. Since Ushikoshi et al do not teach the constitution and the effect of the present invention, Applicants submit that the ceramic heater according to the present invention is neither anticipated by nor obvious in view of Ushikoshi et al.

Kersten et al disclose a cooking apparatus comprising a glass-ceramic plate 10, at least one heat radiator, and at least one sensor 14 arranged underneath the plate 10. As shown in Figure 2, the sensor 14 is urged against the glass-ceramic plate 10 by means of a spring 14a. However, a glass ceramic is not a sintered ceramic. Therefore, the surface of the plate does not have irregularities shown in the attached figure. A glass ceramic has a very smooth surface and does not have the above-mentioned problem at all. Further, Kersten et al do not teach that the sensor 14 is a sheath type thermocouple. In addition, Kersten et al do not teach to form a bottomed hole in the plate and set the sensor in the bottomed hole. The sensor 14 contacts the surface of the plate 10. Therefore, temperature measurement is influenced by ambient atmosphere. It is impossible to precisely measure the temperature.

Since Kersten et al do not teach about a sintered ceramic and a sheath type

thermocouple, one cannot expect from Kersten et al that a precise temperature measurement is realized by pressing a sheath type thermocouple on the bottom portion of a bottomed hole formed in a sintered ceramic plate. Since Kersten et al do not teach the constitution and the effect of the present invention, the ceramic heater according to the present invention is neither anticipated by nor obvious in view of Kersten et al.

Hecht et al disclose a radiant heating body having a plate 3, a radiant heating resistor 7, and a temperature sensor 12. The plate includes a glass ceramic (col. 3, line 27). As shown in Figure 1 of Hecht et al, the radiant heating resistor 7 is arranged in a spiral pattern. Hecht et al do not teach that the temperature sensor 12 is a sheath type thermocouple. Furthermore, the glass ceramic plate 3 is not a sintered ceramic. Moreover, Hecht et al do not teach about a bottomed hole.

Accordingly, one cannot expect from Hecht et al that a precise temperature measurement is realized by pressing a sheath type thermocouple on the bottom portion of a bottomed hole formed in a sintered ceramic plate. Since Hecht et al do not teach the constitution and the effect of the present invention, the ceramic heater according to the present invention is neither anticipated by nor obvious in view of Hecht et al.

Arena et al disclose a heating plate having a bed plate including “n” zones, electrically conducting elements, and “n+1” temperature measuring sensors being positioned at ends of each zone (see Claim 1 of Arena et al). The bed plate is made from a material having good thermal conductivity such as metal, boron nitride or graphite (col. 3, lines 30 to 35). The sensors are preferably thermocouples (col. 3, lines 57 to 58). However, Arena et al do not teach that the sensors are sheath type thermocouples. Further, Arena et al do not teach to press the sensor on the bottom portion of a bottomed hole. Accordingly, one cannot expect from Arena et al that a precise temperature measurement is realized by pressing a sheath type thermocouple on the bottom portion of a bottomed hole formed in a sintered ceramic plate.

Since Arena et al do not teach the constitution and the effect of the present invention, the ceramic heater according to the present invention is neither anticipated by nor obvious in view of Arena et al.

Nobori et al disclose a ceramic heater having a ceramic substrate and a resistant heating element embedded within the ceramic substrate. The ceramic heater shown in Figure 22b of Nobori et al is provided with a pit 74 for positioning a thermocouple for temperature measurement. Nobori et al do not teach that the thermocouple is a sheath type thermocouple. Further, Nobori et al do not teach to press the thermocouple on the bottom portion of the pit.

Accordingly, one cannot expect from Nobori et al that a precise temperature measurement is realized by pressing a sheath type thermocouple on the bottom portion of a bottomed hole formed in a sintered ceramic plate. Since Nobori et al do not teach the constitution and the effect of the present invention, the ceramic heater according to the present invention is neither anticipated by nor obvious in view of Nobori et al.

Yoshida et al disclose a wafer heating apparatus having a ceramic substrate and a heating resistor. Yoshida et al do not teach to form a bottomed hole in the ceramic substrate and press a sheath type thermocouple on the bottom portion of the bottomed hole. Accordingly, one cannot expect from Yoshida et al that a precise temperature measurement is realized by pressing a sheath type thermocouple on the bottom portion of a bottomed hole formed in a sintered ceramic plate.

As discussed during the interview, Claim 12 now contains a feature of Claim 13 that was previously rejected over Ushikoshi et al in view of Kersten et al or Hecht et al. However, as noted during the interview, Kersten et al disclose a cooking apparatus using a glass-ceramic plate,³ and Hecht et al also concern a radiant heater for a cooking apparatus.⁴ As noted above, Applicants respectfully traverse the rejection in view of Kersten et al or Hecht et al, as these

³ Kersten et al, see Abstract.

references utilize a glass medium not having the above-noted irregularities, and thus provide no motivation for one skilled in the art to modify the teachings of Ushikoshi et al. Further, since both Kersten et al and Hecht et al are related to stove-top cooking radiant heaters, there is no motivation for one skilled in the art to apply these non-analogous teachings to the semiconductor heating apparatuses in Ushikoshi et al.

Regarding non-analogous art, M.P.E.P. §2141.01(a) quoting from *In re Clay*, 966 F.2d 656 notes that the court therein found that the inventions involved different fields of endeavors, since the reference taught the use of the gel in a different structure for a different purpose under different pressure and temperature conditions. In the present case, the heaters in the applied references of Kersten et al and Hecht et al and the heater in Ushikoshi et al involve different fields of endeavor being used for different purposes (i.e., heaters for heating semiconductor wafers in corrosive atmospheres versus radiant heating elements for stovetop cooking, and heaters that operate in different temperature regions 300 to 1,100° C versus 0 to 506° C). Accordingly, Applicants submit that one skilled in the art of semiconductor heating apparatuses would not be motivated to utilize teachings from a radiant cooking heater reference to modify a heater in a corrosive semiconductor environment such as that in Ushikoshi et al.

Besides being from different fields of endeavor, the radiant heater configurations in Kersten et al and Hecht et al place the temperature sensing elements in contact with a glass-ceramic plate *remote* from the heating elements unlike in Ushikoshi et al where the heating elements are in the heater body itself. Thus, only by improper picking and choosing based on Applicants' disclosure would one know which parts of Kersten et al and Hecht et al to apply to the semiconductor heater in Ushikoshi et al. The court in *In re Mercier*, 185 USPQ 774 (Fed. Cir. 1975) stated that

The board's approach amounts, in substance, to nothing more than a hindsight "reconstruction" of the claimed invention by relying on *isolated*

⁴ Hecht et al, col. 1, lines 22-23 and 31-33.

teachings of the prior art without considering *the over-all context* within which those teachings are presented. *Without the benefit of appellant's disclosure*, a person having ordinary skill in the art would not know what portions of the disclosure of the reference to consider and what portions to disregard as irrelevant, or misleading. See *In re Wesslau*, 53 CCPA 746, 353 F.2d 238, 147 USPQ 391 (1965). [emphasis added]

Thus, with the applied art of Kersten et al and Hecht et al being non-analogous art to Ushikoshi et al, and without the benefit of the Applicants' disclosure to know which parts of Kersten et al and Hecht et al to consider relevant, Applicants respectfully submit that any combination rejection in view of Kersten et al and Hecht et al is improper.

Indeed, Examiner Paik noted on the Interview Summary Sheet that such arguments should be considered. For the reasons given above, Claim 12 and the claims dependent therefrom are believed to patentably define over the applied prior art.

Furthermore, during the interview, the features of Applicants' Figures 4 and 5 were discussed with regard to mechanisms for pressing the temperature-measuring element to the ceramic plate. Accordingly, new independent Claim 20 defines, as illustrated in Applicants' Figures 4 and 5, a ceramic heater having a temperature-measuring element pressed along a transverse direction of a bottom portion of a bottomed hole in a ceramic plate. This feature is not disclosed or suggested in the applied prior art. Hence, new Claim 20 is likewise believed to patentably define over the applied prior art.

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Consequently, in view of the present amendment and in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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Attachments: Attachment A - Micrograph of an Aluminum Nitride Sintered Ceramic Surface

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